Video
FULL DETAILS AND TRANSCRIPT

Professional Development for the Critical Foundations

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Topic: National Math Panel: Critical Foundations for Algebra
Practice: Mathematics Preparation for Algebra

Highlights

- Importance of focusing professional development on mathematics content as well as pedagogy
- The need for teachers to know the mathematics content they teach
- Why it's important for teachers to know the prerequisites of algebra
- Focus on building teachers' understanding of fractions
- How to use instruction that fosters understanding, proficiency, and the ability to solve problems
- Importance of professional development focused on providing teachers with a deep understanding of the critical foundations

About the Interviewee

Dr. Francis (Skip) Fennell is a member of the National Mathematics Advisory Panel, Chair of the Conceptual Knowledge and Skills Task Group, and member of the National Survey of Algebra I Teachers Subcommittee and Assessment Task Group. Fennell is a mathematics educator and has experience as a classroom teacher, a principal, and a supervisor of instruction. He is a Professor of

Education at McDaniel College in Westminster, MD and the immediate Past President of the National Council of Teachers of Mathematics (NCTM). Widely published in professional journals and textbooks related to elementary and middle-grade mathematics education, Dr. Fennell has also authored chapters in yearbooks and resource books published by the National Council of Teachers of Mathematics. In addition, he has played key leadership roles with NCTM, the Research Council for Mathematics Learning, the Mathematical Sciences Education Board, the National Science Foundation, the Maryland Mathematics Commission, the United States National Commission for Mathematics Instruction, and the Association for Mathematics Teacher Educators.

Dr. Fennell has received numerous honors and awards, including Maryland's Outstanding Mathematics Educator (1990), McDaniel College's Professor of the Year (1997), the Glenn Gilbert National Leadership Award from the National Council of Supervisors of Mathematics, and the CASE - Carnegie Foundation Professor of the Year - Maryland (1997). He has also been the principal investigator on grants from the National Science Foundation, the U.S. Department of Education, the Maryland Higher Education Commission, and the ExxonMobil Foundation.

Full Transcript

My name is Francis (Skip) Fennell. I'm a professor of education at McDaniel College in Westminster, Maryland. I served as a member of the National Mathematics Advisory Panel.

With the implementation of the No Child Left Behind legislation, it's absolutely imperative that teachers assist students in reaching proficiency in mathematics. Some students are going to take more time than others to getting there. Some students are coming from backgrounds where they haven't had the kind of experiences that we would like in terms of mathematics. That teacher is still responsible for that child; that teacher must pick up that child and/or those children and take them from that place to meet that level of proficiency, and so as those challenges mount, we want to make sure that we, frankly, safeguard the classroom teacher and allow him or her the amount of time to do this well.

The issue of professional development for teachers is very, very important. You need to know mathematics. And so we used our critical foundations and the algebra topics to sort of undergird—this is the kind of background you ought to have if you are at the pre-service level in teacher education. Now, assuming that there are now teachers in the field, what do we do in the name of professional development? Well, one of the gaps is this whole area—this whole arena, if you will—of rational number. Were it to be me, I would, you know, probably do a lot of work in building this notion of fraction sense and making sure teachers are far more comfortable with fractions and working with fractions in the various ways we define them and so forth. And that goes back to this national survey of teachers that we did.

We surveyed over a thousand teachers of Algebra I in this country, had over 700 responses back, good response back, and what did they tell us? Well, one of the things they told us was that students ought to know fractions before they get to algebra. Well, duh, of course! But, you know, importantly, we need

to figure out ways to not push kids, rush kids, to algebra. Make sure, first of all, that they have the prerequisites to do that higher-level mathematics, however we title it. And one of those areas might be a teacher's own professional development at the middle school level, at the elementary school level in this area, certainly in the area of measurement and geometry, and also thinking about, okay, what about professional development on the mathematics that we call algebra? One of the conclusions of the Teacher Task Group was that teachers really need to know, and know well, that mathematics that they teach, and so that, to me, frames our professional development efforts. Maybe for middle school teachers, it's making sure they are comfortable with the major topics of school algebra; maybe it's connecting those major topics to the mathematics that comes before that, making sure they are aware of the prerequisites. Because if you are that algebra teacher, and all of a sudden you have kids, students who don't have those prerequisites—and a lot of the teachers in the survey told us that—how do you then back up your algebra course, if you will, and deal with those as you move forward in algebra? So, I mean, some of those challenges are issues, I think, for professional development.

The Panel report provides some good areas for consideration. One is, we know that in the preparation to be a classroom teacher at the elementary school level—depending upon the state, depending upon the institution of higher education, that really varies around this country—but on average, that's about two courses of mathematics, and in some cases that mathematics is not in any way connected to the school mathematics that the teacher is charged in terms of instruction. So as a minimum, professional development arcs around the critical foundations of algebra—whole numbers, fractions—defined again as fractions, decimals, percent leading to ratio and proportion, those particular aspects of geometry and measurement. You know, to me, that's a baseline. Let's go deep into those areas, make sure all of our teachers who teach at the early childhood level, at the elementary school level, know that mathematics and know that mathematics very, very well. I think it's a perfect opportunity in terms of highlighting that as one element of their professional development.

It also means to me that that professional development is mathematics. Absolutely nothing wrong with professional development on pedagogy, but I think it's time that as we think about pedagogy related to the mathematics teacher, that that must be around mathematics content as well. Similarly, were I to wave my magic wand for the middle school level, I would want to ensure—at a time, by the way, that when the majority of middle school teachers in this country do not have a degree nor a minor in mathematics—that that middle school professional development is around mathematics, is around algebra. I want that teacher who is teaching algebra, again, however that's titled, to know the algebra that he or she is teaching, and I would surround that professional development on content, kind of connect that to the pedagogy that may be appropriate for preadolescent students at the middle school level. What's the important mathematics, and then how do we get to instruction that allows students to understand it, become proficient in it, and be able to solve problems showing that they can do it? And by the way, those high school teachers would just love it if those kids who come into algebra had that level of proficiency, understanding, and the ability to solve problems.